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Self-affirmation reduces the socioeconomic attainment gap in schools in England

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Abstract

Background. Studies in the USA show that school students from some ethnic backgrounds are susceptible to stereotype threat, that this undermines their academic performance, and that a series of virtually zero-cost self-affirmation writing exercises can reduce these adverse effects. In England, however, socioeconomic status (SES) is a much stronger predictor of academic success than is ethnic background.

Aims. This study investigates whether self-affirmation writing exercises can help close the SES attainment gap in England by increasing the academic performance of low-SES (but not higher-SES) school students.

Sample. Our sample consisted of students aged 11-14 in a secondary school in southern England ($N = 562$); of these, 128 were eligible for free school meals, a proxy for low SES.

Methods. Students completed three short writing exercises throughout one academic year: those randomly assigned to an affirmed condition wrote about values that were important to them, and those assigned to a control condition wrote about a neutral topic.

Results. On average, the low-SES students had lower academic performance and reported experiencing more stereotype threat than their higher-SES peers. The self-affirmation raised the academic performance of the low-SES students by 0.38 standard deviations but did not significantly affect the performance of the higher-SES students, thus reducing the SES performance gap by 62%. The self-affirmation also reduced the level of stress reported by the low-SES school students.

Conclusions. The benefits of this virtually zero-cost intervention compare favorably with those of other interventions targeting the SES academic attainment gap.

Keywords

stereotype threat; self-affirmation; socioeconomic status; attainment gap; schools

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Self-affirmation is a theoretically-precise psychological intervention that has been shown to improve the academic performance of students who are negatively stereotyped and thus experience stereotype threat. There is extensive evidence that stereotype threat can inhibit the ability of members of negatively stereotyped groups to perform well at relevant tasks (see meta-analyses Lamont, Swift, & Abrams, 2015; Picho, Rodriguez, & Finnie, 2013). Studies in the USA have suggested that stereotype threat can significantly reduce the academic performance of Black and Latino school students, and is estimated to account for 20-28% of the attainment gap between these groups and European Americans (Walton & Spencer, 2009). We are interested in how stereotype threat translates from schools in the USA to those in England. This is a crucial question because, in contrast with the USA, poor educational outcomes in England are associated much more strongly with low socioeconomic status (SES) than they are with ethnicity.

To investigate stereotype threat in England, we draw on evidence demonstrating that self-affirmation interventions can effectively reduce its adverse effects on the academic performance of underachieving groups (e.g. Cohen, Garcia, Apfel, & Master, 2006; Sherman et al., 2013). We thus conduct the first ever study in a school in England that investigates whether a self-affirmation intervention can raise the performance of low-SES school students and thus reduce the academic attainment gap

between them and their higher-SES peers. We also investigate psychological processes that might underpin any effects of the self-affirmation.

Background

Educational inequalities. Educational inequalities rightly receive much attention in academic research and policy formulation. In the USA, there are large gaps in educational outcomes between White students and lower-performing minority ethnic groups, in particular Black and Latino students, and between students of lower and higher socioeconomic status (SES). Both these gaps are substantial at age 13-14: the SES gap is of a similar magnitude to the corresponding gap between Black students and White students (National Assessment of Educational Progress, 2016)¹.

In England, by contrast, the largest education gap by far is associated with SES. As a result, this gap is a major focus of educational policy spearheaded by the £2.4bn per annum Pupil Premium initiative (Foster & Long, 2017). Only 34% of school students in England who are eligible for free school meals (FSM), an indicator of low SES, meet a standard threshold measure of academic attainment, compared with 61% of those whose parents are better off, a difference of 27% (Department for Education, 2015). The corresponding differences between the four major ethnic classifications – Black, White, Asian² and Mixed – are much smaller. In fact, the difference between

¹ Details and limitations of these and the other calculations in this section are available in the Supporting Information.

² In England, ‘Asian’ refers to students mainly of Bangladeshi, Indian and Pakistani backgrounds.

the lowest performing major ethnic classification (Black students) and the majority classification (White students) is only 3% (Department for Education, 2015).

Although there are important interactions between SES and ethnicity in both countries (Brannon, Higginbotham, & Henderson, 2017; Department for Education, 2015; Harackiewicz, Canning, Tibbetts, Priniski, & Hyde, 2016; Strand, 2014), it is clear that in England SES is a significantly stronger predictor of academic success than is ethnicity, while in the USA it is not. Why should this be so? We suggest that stereotype threat might be an important factor.

Stereotype threat. Although definitions vary (Shapiro & Neuberg, 2007), in broad terms stereotype threat is the sense of threat that people feel in a given context when they believe that they risk conforming to a negative stereotype about a group of which they are a member (Steele & Aronson, 1995). Stereotype threat reduces performance in a wide range of contexts including academic performance. A meta-analysis (Walton & Spencer, 2009) showed that negatively stereotyped students who were under conditions of stereotype threat performed on average more than 0.5 standard deviations worse than those who were not (Walton & Spencer, 2009, Figure 1).

However, other studies have found more limited evidence that stereotype threat reduces performance. For example, while a meta-analysis showed that stereotype threat had a significant negative effect of 0.22 standard deviations on girls' performance in mathematics tests, it also found evidence of publication bias that is likely to have inflated the effect (Flore & Wicherts, 2015). One potential source of such publication bias may be null effects in studies that have not taken into account

specific social contexts such as the local relative size of the stereotyped group, an area that we explore in the following section on self-affirmation theory.

In particular, stereotype threat has been shown to reduce the academic performance of students of low SES. In one study, French undergraduate students were given a difficult verbal test (Croizet & Claire, 1998). Low-SES students who were told that the test was a measure of verbal intelligence performed worse than those who were told that it was an investigative tool for studying hypotheses about lexical processes, whereas higher-SES students performed the same regardless of what they were told. Other studies have found similar effects in low-SES students ranging from six-year-olds to college students (Browman, Destin, Carswell, & Svoboda, 2017; Désert, Préaux, & Jund, 2009; Good, Aronson, & Inzlicht, 2003; Spencer & Castano, 2007).

Self-affirmation theory. The negative effects of stereotype threat are thought to result from maladaptive responses aimed at protecting a person's 'self-integrity', their view of themselves as a 'good and adequate' person (Cohen & Sherman, 2014). These maladaptive responses include denial of the threat (Epton, Harris, Kane, Koningsbruggen, & Sheeran, 2015), concretisation of construal levels (Sherman et al., 2013), increased vigilance (Murphy, Steele, & Gross, 2007), increased stress (Creswell, Dutcher, Klein, Harris, & Levine, 2013) and allocation of executive function thus reducing its availability for other tasks (Hall, Zhao, & Shafir, 2014; Johns, Inzlicht, & Schmader, 2008). People can avoid these responses by strengthening their self-integrity in domains unrelated to the threat, a process known as 'self-affirmation'. Studies have shown self-affirmation to be an effective buffer against psychological threat in many situations, including in educational settings such

as colleges (see e.g. Harackiewicz et al., 2013; Kinias & Sim, 2016; Martens, Johns, Greenberg, & Schimel, 2006; Miyake et al., 2010; Shapiro, Williams, & Hambarchyan, 2013; Silverman, Logel, & Cohen, 2013; Tibbetts et al., 2016) and massive open online courses (Kizilcec, Saltarelli, Reich, & Cohen, 2017).

There is also an increasing body of evidence relating to the effectiveness of self-affirmation in reducing stereotype threat in schools. Here, studies have found evidence that self-affirmation increased academic performance in Black and Latino, but not White, middle school students aged 11 to 14 (Cohen et al., 2006; Sherman et al., 2013). Follow-up studies have found that positive effects of self-affirmation on ethnic minority students persist over time. Remarkably, one study found benefits to college enrolment up to nine years after the self-affirmation intervention (Goyer et al., 2017) and another found improvements in academic achievement up to three years after the intervention, including spanning the transition from middle to high school (Borman, Grigg, Rozek, Hanselman, & Dewey, 2018). The authors argue that this occurs when the short-term benefits trigger a set of complex and interconnected processes that recursively build on themselves over long periods. Initial boosts in performance can increase confidence for future tests, reducing stress (Creswell et al., 2005) and generating a greater sense that the individual belongs and fits in the academic world (Cook, Purdie-Vaughns, Garcia, & Cohen, 2012; Shnabel, Purdie-Vaughns, Cook, Garcia, & Cohen, 2013). Over time, this can change teachers' and peers' perceptions of ability, raising expectations and generating support for higher levels of academic challenge (Cohen & Sherman, 2014).

However other studies in schools have shown more nuanced effects, where self-affirmation provided benefits to minority ethnic students by some academic measures but not others (Borman, Grigg, & Hanselman, 2016), when certain conditions held (Dee, 2015; Hanselman, Bruch, Gamoran, & Borman, 2014), or when used in conjunction with enhancements to the intervention (Bowen, Wegmann, & Webber, 2013; Covarrubias, Herrmann, & Fryberg, 2016; Hernandez, Rana, Rao, & Usselman, 2017). Yet other studies, in schools with a wide range of characteristics, have shown no significant effect of self-affirmation at all (Bratter, Rowley, & Chukhray, 2016; de Jong, Jellesma, Koomen, & de Jong, 2016; Hanselman, Rozek, Grigg, & Borman, 2017; Protzko & Aronson, 2016).

This variation indicates the possibility that there are important moderators that vary across school contexts of the extent to which stereotype threat is experienced by different groups, and/or the effectiveness of self-affirmation (Borman, 2017; Ferrer & Cohen, 2018). For example, a follow-up to the study by Borman and colleagues (2016) found that self-affirmation was more effective at increasing the performance of Black and Latino students in schools where they were relatively few in number and had a relatively large attainment gap with white students, and where they used affirming language (such as “care about”) in their writing exercises (Borman et al., 2018).

This brings us back to our earlier question of why, in England, SES is a significantly stronger predictor of academic success than is ethnicity, while in the USA SES and ethnicity predict success with similar strength. Perhaps one factor is that differing

national cultural contexts result in differing ‘threats in the air’ (Steele, 2010) between the two countries.

In the USA, race has historically been, and remains, a highly salient cultural divide with deep historical roots (Gándara & Contreras, 2009; Steele, 2010), and both race and low SES have been shown to create threat and other psychological barriers to academic achievement (Jury et al., 2017; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012; Stephens, Markus, & Fryberg, 2012). In contrast, while there certainly remain important challenges in relation to educational inequalities arising from ethnicity in England (Equality and Human Rights Commission, 2015, 2016), the country’s long history of striking disparities between classes is likely to mean that societal discourses around the educational performance of different social classes are more deeply rooted and thus more psychologically salient (Evans, 2006; Jones, 2016). It seems plausible, therefore, that low SES generates a higher level of stereotype threat within education in England than in the USA³.

Present Study

The present study tests our predictions over the course of an academic year in a comprehensive secondary school in southern England. The school is moderately large, is ethnically highly diverse, and has an above-average proportion of students eligible for free school meals. Students completed three short writing exercises

³ Such an overall higher level of threat for low-SES individuals might, however, be experienced differently by individuals of different ethnicities.

throughout the year: students in a self-affirmed condition wrote about values that were important to them, and students in a control condition wrote about a neutral topic. As a primary outcome measure, we observed the effect of the self-affirmation on scores in a mathematics test that students undertook towards the end of the school year. To provide a secondary outcome measure, students completed a survey near the end of the school year measuring four psychological processes (stereotype threat experienced, stress, self-integrity, and sense of academic fit) that might help explain how self-affirmation improves academic performance.

We used students' eligibility for free school meals (FSM) as a proxy for low SES. Eligibility for FSM is based on current parental income and nationally around 14% of school students are eligible⁴ (Department for Education, 2015). Although FSM has a number of limitations as a proxy for low SES (discussed in detail later), it was the best measure available to us (Gorard, 2012). Its key benefit is that it indicates that a student's family has a *current* low income; the student's low SES is therefore likely to be particularly salient and as a result create the highest levels of stereotype threat.

To summarise our argument: stereotype threat has been shown to reduce academic performance, self-affirmation has been shown to reduce stereotype threat, and low SES is a plausible cause of stereotype threat in England. Taking eligibility for FSM as a proxy for low SES we therefore state our hypothesis as follows. FSM students in a self-affirmation condition will achieve higher grades in mathematics tests than FSM

⁴ See the Supporting Information for FSM eligibility criteria.

students in a control condition; however non-FSM students will be unaffected by the self-affirmation.

Method

Participants

A comprehensive secondary school in southern England agreed to take part in the study during the 2015-16 school year⁵. No significant ethical issues were raised by the study, which therefore received ethical approval from the head of the relevant academic programme. Students in Years 7 to 9 (aged 11 to 14) participated. At the start of the autumn 2015 term, we randomly assigned individual students to two experimental conditions: affirmed and control.

Of the 722 students registered at the start of the academic year, 562 were included in the analysis (see Supporting Information for details). Eliminations were mainly due to missing academic baseline ($N = 68$) and assessment data ($N = 49$) and non-completion of writing exercises ($N = 36$). Eliminations were not significantly heterogeneous across experimental conditions. Our sample size was thus determined by the number and characteristics of pupils in the participating year groups. Demographic and prior achievement variables of the sample are provided in the Supporting Information.

⁵ A second school also agreed to participate but for logistical reasons was unable to provide data on the primary outcome measure (percentage scores in academic tests), and so we were unable to include it in our analysis.

Procedure

Figure 1 shows the timeline for the administration of the research activities.

[INSERT FIGURE 1 HERE]

Materials. We based the wording of the writing exercises on that reported by Sherman and colleagues (2013). In the affirmed condition, the exercises were designed to invoke a self-affirmation; the student was asked to pick one or more values that are “the most important things for you, personally” and to write about “why these things are important to you”. In the control condition, the exercises were designed to be psychologically neutral; the corresponding request was to write about values that are “the least important things to you, but might be important to someone else”, or about the student’s morning routine that day. At our request, a teacher informally pre-tested the exercises with three Year 9 students from another school and found no issues with comprehension. All experimental materials are available in the Supporting Information.

To provide our secondary outcome measure, a short student survey was developed to record students’ self-reports in levels of: *stereotype threat experienced* (single item: “I worry that people judge me because of my background instead of who I really am”), *stress* (single item: “I often feel stressed at school”), *self-integrity* (single item: “I feel basically OK about myself”), and *sense of academic fit* (four items e.g. “I fit in well at

school and really feel like I belong here”, “I feel proud of being a student at [school name]”, $\alpha = .76$)⁶.

These areas were drawn from emerging evidence or adapted from other measures related to the mechanisms by which self-affirmations protect people from stereotype threat. The *stereotype threat experienced* and *self-integrity* measures were designed to measure the degree to which prevalent negative stereotypes resulted in a subjective experience of threat and the degree to which the self-affirmation intervention reduced this by bolstering a student’s self-integrity (Cohen & Sherman, 2014; Sherman et al., 2013). The *stress* measure was designed to examine whether the intervention reduced one of maladaptive responses that stereotype threat is hypothesised to increase (Creswell et al., 2013; Sherman et al., 2013). Finally, the *sense of academic fit* measure was designed to measure the extent to which identity threat undermined students’ sense of belonging in school (Cook et al., 2012; Sherman et al., 2013; Walton & Cohen, 2007).

We used mainly single-item measures in order to enable the survey to be completed within the constraints of the school timetable. Students were presented with a series of statements and asked to respond on a six-point rating scale from “Strongly agree” to “Strongly disagree”. Responses were converted to a point score of 1-6 and reverse-

⁶ Items related to growth mindset were also included in the survey to provide input to a separate initiative being undertaken by the school, but these did not form part of the present study.

coded where necessary so that higher scores reflected a higher level of the item measured.

Self-affirmation procedure. English teachers (blind to the precise purpose of the study) were briefed near the beginning of the school year. Administration followed the method outlined by Sherman and colleagues (2013). In normal class time in English lessons, the teachers (blind to affirmation condition) introduced the exercises as a short piece of writing to give the opportunity to write more freely than usual, without worrying about spelling or grammar. Each exercise took around 15-20 minutes to complete.

Student survey procedure. The student survey was administered in June 2016 during ‘house time’, a period when small groups of students from all Year Groups engage in a range of activities.

Outcome Measures

Our primary outcome measure was academic performance as measured by the school’s usual assessment procedures. Due to limited availability of baseline measures and practical constraints in collecting percentage scores for other academic subjects, our primary outcome measure was limited to the percentage score from the mathematics test that each student undertook towards the end of the school year. For Years 7 and 8, tests consisted primarily of questions from past General Certificate of Secondary Education (GCSE) Mathematics papers. For Year 9, tests consisted of an entire past GCSE Mathematics paper.

GCSEs are national standardized exams used to assess academic performance at age 16. They have a high level of reliability (Bramley & Dhawan, 2010; Newton, 1996).

Each test for Years 7 and 8 also included a smaller number of questions taken from past papers of Key Stage 3 Mathematics SATs, national standardized tests undertaken by students at the end of Year 9 (usually at age 14) until the Department for Education (DfE) discontinued their use in 2009.

For each Year Group, the school assembled questions from the above sources into two tests at differing tiers of difficulty, and each student was assigned to take one of these two tests, based on their prior performance. No empirically validated means existed to establish equivalent levels of performance between the two tiers of tests taken within each Year Group, or between Year Groups. We therefore standardized the percentage scores for each of the two test tiers within each of the three Year Groups, resulting in six sets of standardized scores.

Our analytical design allowed for the possibility that there might be interactions between test tier, FSM status and affirmation condition. For example, FSM students assigned to the lower-difficulty tier might feel further threatened in respect of their academic performance, making the self-affirmation intervention more effective for them compared to FSM students assigned to the higher-difficulty tier.

In order to increase the sensitivity of the outcome measure, we used students' mathematics scores measured in national standardized tests at the end of Key Stage 2 (Year 6, age 11) as the most reliable and relevant baseline measure of prior mathematics performance (Opposs & He, 2011).

The school also provided the following information for each student which we used as further covariates: Year Group, ethnicity, and markers for eligibility for Free School Meals (FSM), gender and English as an Additional Language (EAL)⁷.

Our secondary outcome measure was students’ responses to the student survey.

Results

Descriptive statistics of academic performance and raw survey responses are shown in Table 1. Correlations are provided in the Supporting Information.

[INSERT TABLE 1 HERE]

Primary outcome: academic performance

We subjected the standardized end-of-year mathematics scores to a 2 (FSM status: FSM vs non-FSM) x 2 (affirmation condition: affirmed vs control) x 2 (test tier: lower difficulty vs higher difficulty) ANCOVA. We included the following covariates: baseline Key Stage 2 mathematics score, gender, Year Group (Year 8 and Year 9, with Year 7 as reference category), ethnicity (Black, Asian, Mixed, and Other, with White as the reference category) and the marker indicating English as an Additional

⁷ A complete record of information provided by the school is in the Supplemental Information.

Language (EAL). We mean-centered the baseline Key Stage 2 mathematics scores for the FSM and non-FSM groups separately⁸.

Tests for non-influential outliers and homogeneity of variances were met but tests for normal distribution of residuals were not⁹. We therefore amended our ANCOVA to be robust to non-normal distribution of residuals by using the SPSS ‘bootstrap’ method with 2000 random samples. For main effects, the standard errors (*SE*), 95% bias-corrected and accelerated confidence intervals (BCa CI) and *p*-values reported below are based on these bootstrapped (robust) estimates. However, SPSS does not have the facility to report bootstrapped estimates for interactions and so these results are not robust to non-normal distribution of residuals, and we note this where relevant.

⁸ In line with Sherman and colleagues (2013), we wanted to avoid apparently reducing the pre-existing gap between FSM and non-FSM students. Using unmanipulated baseline scores as a covariate could have given a misleading impression that the gap was smaller than it actually is (Sackett, Hardison, & Cullen, 2004). However, supplementary analyses using unmanipulated baseline scores yielded substantially similar results.

⁹ Additionally, the following interactions violated the assumption of homogeneity of regression slopes: FSM status * Black ethnicity; FSM status * mixed ethnicity; and affirmation condition * Year 8. Including these interaction terms in the ANCOVA model increased the significance of the focal effect (the affirmation condition * FSM status interaction). Therefore, given that the model without these interaction terms yielded substantively unchanged results while being somewhat more conservative and parsimonious, we report the results of the simpler model in the manuscript.

This analysis yielded a significant main effect of FSM status on academic performance, $F(1, 545) = 20.021, p < .001, \eta_p^2 = .035$. The academic performance of students that were eligible for FSM ($M = -0.289, SE = 0.070$, BCa CI [-0.420; -0.140]) was significantly lower than those that were not eligible ($M = 0.075, SE = 0.051$, BCa CI [-0.029; 0.178]), a mean difference of $M_{diff} = -0.364$ (BCa CI [-0.500; -0.215]).

There was a significant main effect of affirmation condition on academic performance, $F(1, 545) = 7.202, p = .005, \eta_p^2 = .013$. The academic performance of students in the affirmed condition ($M = 0.000, SE = 0.065$, BCa CI [-0.128; 0.137]) was significantly higher than those in the control condition ($M = -0.215, SE = 0.056$, BCa CI [-0.328; -0.096]), a mean difference of $M_{diff} = 0.215$ (BCa CI [0.077; 0.363]). There was also a significant main effect on academic performance of test tier, $F(1, 545) = 67.215, p < .001, \eta_p^2 = .110$. The academic performance of students in the easier tier ($M = 0.328, SE = 0.072$, BCa CI [0.189; 0.479]) was significantly higher than that of those in the harder tier ($M = -0.542, SE = 0.070$, BCa CI [-0.685; -0.400]), a mean difference of $M_{diff} = 0.869$ (BCa CI [0.666; 1.072])¹⁰.

In line with our hypothesis, the significant main effect of affirmation condition was qualified by a significant two-way interaction between FSM status and affirmation condition, $F(1, 545) = 4.154, p = .042$ (non-robust), $\eta_p^2 = .008$. A decomposition of this interaction showed a significant simple main effect of affirmation condition for

¹⁰ However this effect is non-significant when covariates are not included in the model.

FSM students, $F(1, 545) = 7.192, p = .003, \eta_p^2 = .013$, but not for non-FSM students, $F(1, 545) = 0.448, p = .497, \eta_p^2 = .001$. Academic performance was higher for FSM students in the affirmed condition ($M = -0.099, SE = 0.099, \text{BCa CI} [-0.280; 0.113]$) than for FSM students in the control condition ($M = -0.478, SE = 0.088, \text{BCa CI} [-0.645; -0.305]$), a mean difference of $M_{diff} = 0.379$ ($\text{BCa CI} [0.128; 0.642]$), or 0.381 SD (where $SD = 0.996$, Table 1). Thus the gap of 0.527 (0.529 SD) between FSM and non-FSM students in the control condition was reduced by 62% in the affirmed condition (see Section 5 of the Supporting Information for detailed calculations). This is shown in Figure 2¹¹.

All interactions with test tier were non-significant: these consisted of the three-way interaction of test tier with FSM status and affirmation condition, and the two-way interactions of test tier with FSM status and with affirmation condition (all $F_s < 2.686$, all $p_s > .102$, non-robust).

[INSERT FIGURE 2 HERE]

¹¹ The Supporting Information contains a sensitivity analysis of these results without covariates.

Unsurprisingly (since removing the covariates reduced the power of the analysis), the p -values and confidence intervals are expanded and, while the two-way interaction between FSM status and affirmation condition is non-significant, the simple main effect of affirmation condition on FSM students is substantially unchanged.

Secondary outcome: self-reported measures.

We subjected each of the self-reported measures of the end-of-year student survey to a 2 (FSM status: FSM vs non-FSM) x 2 (affirmation condition: affirmed vs control) x 2 (test tier: lower vs higher) ANCOVA with 2000 bootstrapped samples and the same covariates as for academic performance above. We also performed robust (bootstrapped with 2000 samples) regression analyses using the PROCESS V2.16.3 SPSS macro (Hayes, 2013) to investigate mediation of students' academic performance by each of the self-reported measures.

Our analysis yielded no main effects of FSM status for reported stress, self-integrity or sense of academic fit (all F s < 2.238, all p s > .135), but it did yield a main effect for reported stereotype threat, $F(1, 508) = 7.339, p = .009, \eta_p^2 = .014$. FSM students reported that they experienced significantly higher levels of stereotype threat ($M = 3.699, SE = 0.160$, BCa CI [3.373; 4.034]) than non-FSM students ($M = 3.212, SE = 0.084$, BCa CI [3.044; 3.392]), a mean difference of $M_{diff} = 0.487$ ($SE = 0.180$, BCa CI [0.147; 0.842]). No processes reported in the survey significantly mediated the FSM gap in academic performance.

There was a non-significant three-way interaction between FSM status, affirmation condition and test tier for all four processes reported in the survey (all F s < 0.853, all p s > .356). There was a marginally significant two-way interaction between affirmation condition and test tier for reported stress, $F(1, 501) = 2.859, p = .091$ (non-robust), $\eta_p^2 = .006$, and a significant interaction between FSM status and test tier for reported self-integrity, $F(1, 501) = 3.872, p = .050$ (non-robust), $\eta_p^2 = .008$. All other two-way interactions between affirmation condition and test tier and between

FSM status and test tier were non-significant (all F s < 1.342, all p s > .247). There were non-significant two-way interactions between FSM status and affirmation condition for reported stereotype threat, self-integrity and sense of academic fit (all F s < 1.003, all p s > .311). However there was a marginally significant two-way interaction between FSM status and affirmation condition for reported stress, $F(1, 501) = 3.004, p = .084$ (non-robust), $\eta_p^2 = .006$. A decomposition of this interaction showed a significant simple main effect of affirmation condition for FSM students, $F(1, 501) = 4.122, p = .032, \eta_p^2 = .008$, but not for non-FSM students, $F(1, 501) = 0.012, p = .919, \eta_p^2 < .001$. Reported levels of stress were lower in FSM students in the affirmed condition ($M = 3.191, SE = 0.200$, BCa CI [2.796; 3.590]) than FSM students in the control condition ($M = 3.793, SE = 0.214$, BCa CI [3.388; 4.215]), a mean difference of $M_{diff} = -0.603$ ($SE = 0.288$, BCa CI [-1.172; -0.037]). This is shown in Figure 3.

[INSERT FIGURE 3 HERE]

No processes reported in the survey significantly mediated the interaction between FSM status and affirmation condition on academic performance.

Discussion

Summary of results

We tested whether, over the course of an academic year, a virtually zero-cost self-affirmation intervention reduced gaps in academic performance of school students aged 11-14 based on their socioeconomic status (SES). We also examined whether

students' self-reports of a set of psychological processes were associated with any academic performance gaps and whether they helped explain any reduction in those gaps caused by the self-affirmation intervention.

We observed a significant gap in academic performance between FSM and non-FSM students, which in the control condition was 0.529 standard deviations; we also found that FSM students reported experiencing significantly more stereotype threat than their non-FSM peers.

As predicted, the intervention significantly improved the academic performance of the FSM school students and we found no evidence for any effect on their non-FSM peers. Specifically, the intervention increased the performance of FSM students by 0.381 standard deviations, reducing the FSM/non-FSM gap by 62% (Figure 2). We also found that the self-affirmation intervention reduced the levels of stress reported by FSM students, but not those reported by non-FSM students (Figure 3).

General discussion

This study represents the first direct evidence that self-affirmation can substantially improve the academic performance of low-SES students in a school setting, while not affecting their higher-SES peers¹².

The effect size of 0.38 standard deviations for low-SES students in the present study lies within the 0.29–0.45 range of the effects for Black and Latino students in the

¹² Such evidence has, however, been found in college settings (e.g. Harackiewicz et al., 2013).

earlier studies (Cohen et al., 2006; Sherman et al., 2013), but is much greater than those of later studies where there were much smaller or no significant effects (see Hanselman et al., 2017, Figure 1).

As we have speculated, it is possible that different countries might present different pictures of how stereotype threat operates within them (for a broad discussion of the effect of context see Pettigrew, 2017). Such differences might help explain why, for example, no effects of self-affirmation were observed in students of Moroccan and Turkish backgrounds in a school in the Netherlands (de Jong et al., 2016). Since many of the students chose to write about Islam, a religion about which there are popular associations with extremism in the Netherlands (Kamans, Gordijn, Oldenhuis, & Otten, 2009), the authors speculate that this could have actually *increased* their sense of stereotype threat. Future studies in a range of countries could help tease out these and other such effects of national and cultural contexts.

Our examination of the psychological processes provided some intriguing results related to SES. Firstly, FSM students reported experiencing higher levels of stereotype threat than their non-FSM peers; however, the self-affirmation intervention did not reduce this self-reported sense of threat. Since prior research suggests that self-affirmation is effective because it protects against threat (see Cohen & Sherman, 2014 for a review), it is possible that the intervention did reduce the sense of threat but that limitations in our survey measure meant that it failed to detect this reduction. For example, our measure asks students to self-report a largely unconscious process, is generic in relation to the source and context of threat, and consists of only a single item. However it is also possible that the self-affirmation did not reduce levels of

stereotype threat, but rather it improved academic performance through some other mechanism or helped the students to better cope with the threat, for example by providing more effective access to psychological resources or by bolstering an aspect of their self-identity. Future research could attempt to distinguish between these possibilities, for example by using a more sophisticated measure of stereotype threat such as daily experience sampling (Sherman et al., 2013), or by examining the extent to which cultural mismatches rather than stereotype threat reduce low-SES students' performance (Stephens, Fryberg, & Markus, 2012; Stephens, Hamedani, & Destin, 2014).

Secondly, the self-affirmation reduced the levels of stress reported by FSM students, and we found no evidence that it did so for their non-FSM peers. This observation is consistent with evidence that self-affirmation reduces stress (Creswell et al., 2005) and improves problem-solving for chronically-stressed individuals (Creswell et al., 2013). It is particularly encouraging since it points to the potential of self-affirmation to reduce the chronic stress that disproportionately affects low-SES children and young people (Evans & Schamberg, 2009). Since in England one in ten school students has a diagnosable mental illness and three in four mental illnesses start in childhood (MQ, 2017), with particular prevalence among lower-SES girls (Patalay & Fitzsimons, 2018), any reduced susceptibility to such conditions arising from reduced stress could generate important benefits that are much broader than academic performance.

This reduced stress also suggests a potentially novel line of research. There is extensive evidence that school transitions are particularly threatening for students

(Barber & Olsen, 2004; Rice, Frederickson, & Seymour, 2011; Riglin, Frederickson, Shelton, & Rice, 2013; Zeedyk et al., 2003), and students have been shown to feel even higher levels of concerns about the primary-secondary transition towards the end of primary school than they do at the start of secondary school (Lester, Lisk, Carr, Patrick, & Eley, 2018). If self-affirmation does reliably reduce stress, it might therefore be particularly effective just before students make the transition to secondary school at age 11. As far as we are aware, no study has yet examined this.

Since we needed to exclude students who performed none of the three writing exercises, we did so by excluding those who did not complete the first (in the autumn term). In two sensitivity analyses we tested the effect of excluding students simply by whether they performed at least one or at least two exercises, regardless of their timing. This slightly reduced the extent to which the SES gap was reduced, from 62% to 60% and 56% respectively (details in the Supporting Information). This might be because the autumn exercise offered the longest period for the hypothesised recursive effects of self-affirmation to generate benefits, and/or because it took place at the start of a school year, a time that is likely to be particularly threatening (Sherman et al., 2013).

A supplementary analysis, in which we extended the definition of low SES to students who had been eligible for FSM in any of the last six years, found no evidence of any benefit (details in the Supporting Information). This suggests that low SES might cause stereotype threat only when it is currently of high salience. To the extent that this result can be generalised to the wider school population in England, it would mean that the potential benefits of self-affirmation would be restricted to the school

population that is eligible for FSM at any given time (currently 14%). Given the almost zero-cost of the intervention, and its focus on the most disadvantaged students, this could nevertheless represent an important opportunity from the perspective of educational policy.

Each student was assigned to their mathematics class based on prior performance (a practice known as ‘tracking’ in the US and ‘setting’ in the UK), and so almost all students in any given class took a test of the same tier of difficulty. However, we observed no significant two- or three-way interactions between test difficulty tier and FSM status or affirmation condition. If, as prior research suggests, self-affirmation is effective because it protects against threat, then this suggests that the practice of setting did not exacerbate feelings of stereotype threat in the lower sets. This is an encouraging finding, since it suggests that, at least in this school, the potentially disproportionately negative impact of setting on lower-SES students (Batrach, Autin, Bataillard, & Butera, 2018; Francis, Hodgen, Tereshchenko, & Archer, 2018) did not include the extra burden of further stereotype threat.

Five limitations of our study could be addressed in future studies. Firstly, our primary outcome variable was based on a single academic subject, mathematics, using tests administered by the school. Future studies using national standardized tests, such as GCSEs in a range of subjects at age 16, would provide results that are more robust and generalizable. For example, self-affirmation might benefit cognitive processes that are required more in some subjects than in others, a possibility suggested by one study where indicative benefits of self-affirmation were found in mathematics but not in reading (Borman et al., 2016). Secondly, our study measured academic

performance over a single academic year; a follow-up study could look at performance over an extended period in order to test for any long-term benefits of the complex recursive processes hypothesised by others (Borman et al., 2018; Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Goyer et al., 2017; Sherman et al., 2013).

Thirdly, we did not have a sufficient sample size to robustly examine moderating factors. These include: whether low-SES students of different ethnic backgrounds experience different levels of benefit from self-affirmation, an effect that is plausible given the important interactions between SES and ethnicity in academic performance (Harackiewicz et al., 2016; Strand, 2014); the degree of stereotype threat present (Hanselman et al., 2014); and the extent to which students are situated in a learning environment that supports changes in their behaviour (Cohen & Sherman, 2014; Ferrer & Cohen, 2018). A range of future studies could help build a robust picture of the extent to which the variability observed in the effectiveness of self-affirmation in schools is due to such moderators, or to experimental factors such as implementation constraints (e.g. Protzko & Aronson, 2016), the timing of the intervention (Cook et al., 2012; Critcher, Dunning, & Armor, 2010; Ferrer & Cohen, 2018) and sampling variation (see Gelman & Carlin, 2014; Hanselman et al., 2017).

Fourthly, although eligibility for free school meals is a reasonable proxy for current low SES (Gorard, 2012), it is an imperfect one. For example, for technical reasons some families outside the lowest income brackets are not eligible (Hobbs & Vignoles, 2010) and an estimated 14% of families who *are* eligible are not flagged as such (Department for Education, 2018; Samaira Iniesta-Martinez & Evans, 2012). It also

does not take into account any cumulative effects of chronic poverty over an extended period (Andrews, Robinson, & Hutchinson, 2017; Micheltore & Dynarski, 2017) or important non-financial elements of socioeconomic status such as parental education and parental occupation (Harwell & LeBeau, 2010; Reardon, 2011). Further studies could use more sophisticated indicators to examine the effect of these distinct components of SES.

Finally, in the context of long-term trends in the skills required for the future workforce (Chui, Manyika, & Miremadi, 2016; EY, 2015), evidence about whether self-affirmation improves non-cognitive abilities such as persistence and creativity will increasingly be of value to social and economic policymakers (Garcia, 2014; Gutman & Schoon, 2013).

Additionally, while we confirm that our hypothesis was set prior to gathering our outcome measures, we did not pre-register the study. We report analyses for all other relevant measures obtained from the school in the Supporting Information and would welcome future pre-registered studies investigating the role of SES in stereotype threat and self-affirmation in England.

Conclusion. With an effect size of 0.38 standard deviations on the academic performance of the most economically disadvantaged school students, a virtually zero-cost self-affirmation intervention compares favorably with other interventions aimed at reducing the SES gap (Education Endowment Foundation, n.d.). However, evidence from other studies is mixed and we are still at an early stage of understanding the mechanisms by which self-affirmation works, and the contexts in which it is likely to be most effective. This is an exciting time for research into an

intervention that has the potential to make a substantial difference to the lives of many young people from the most disadvantaged backgrounds.

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TABLE 1

Descriptive statistics of academic performance and raw survey responses of the analytical sample

	All		Free school meals		Non-free school meals	
	Mean	SD	Mean	SD	Mean	SD
Academic performance						
Standardized mathematics score	0.000	0.996	-0.235	0.896	0.069	1.014
Raw survey responses						
Stereotype threat	3.320	1.718	3.650	1.722	3.220	1.706
Stress	3.520	1.608	3.400	1.635	3.550	1.601
Self-integrity	4.470	1.315	4.370	1.387	4.500	1.294
Sense of academic fit	4.019	0.996	3.979	1.059	4.030	0.978

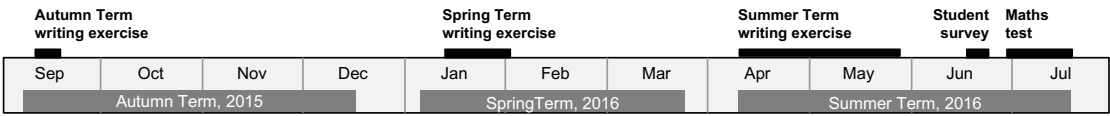


Figure 1. Research timeline.

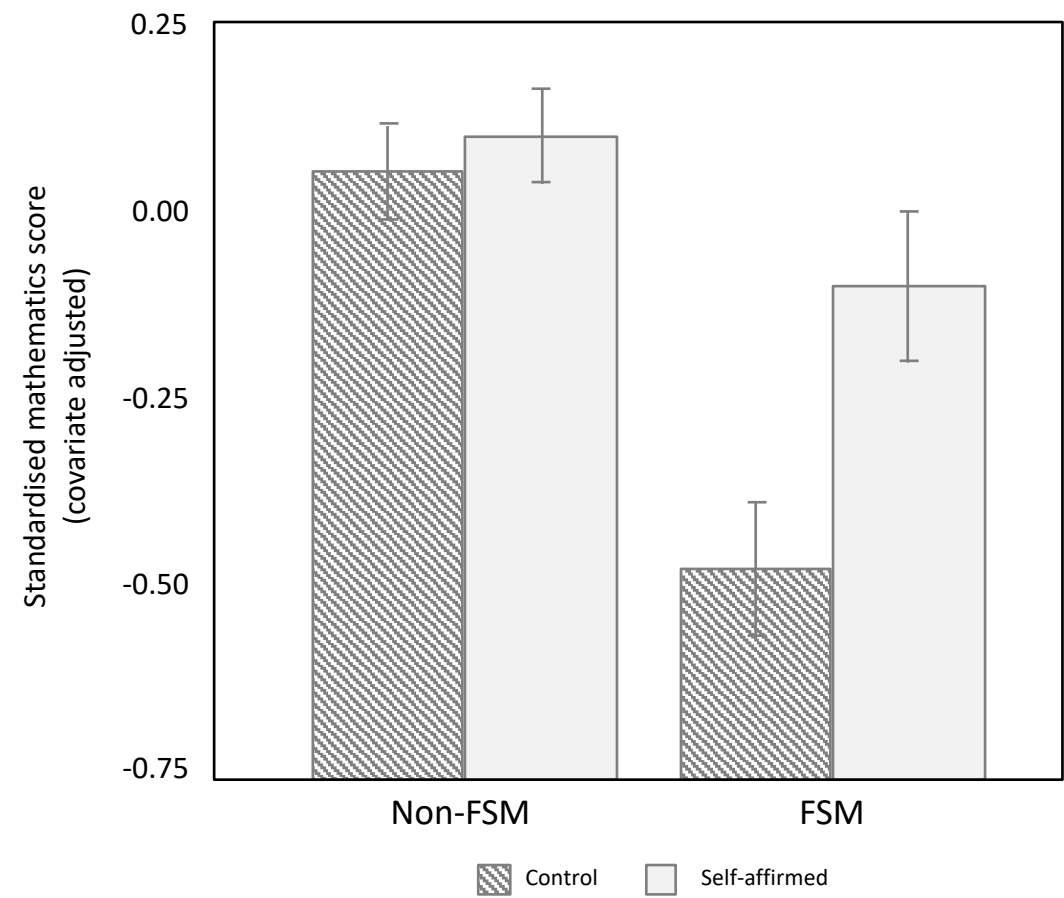


Figure 2. Academic performance as a function of free school meal (FSM) status and affirmation condition.

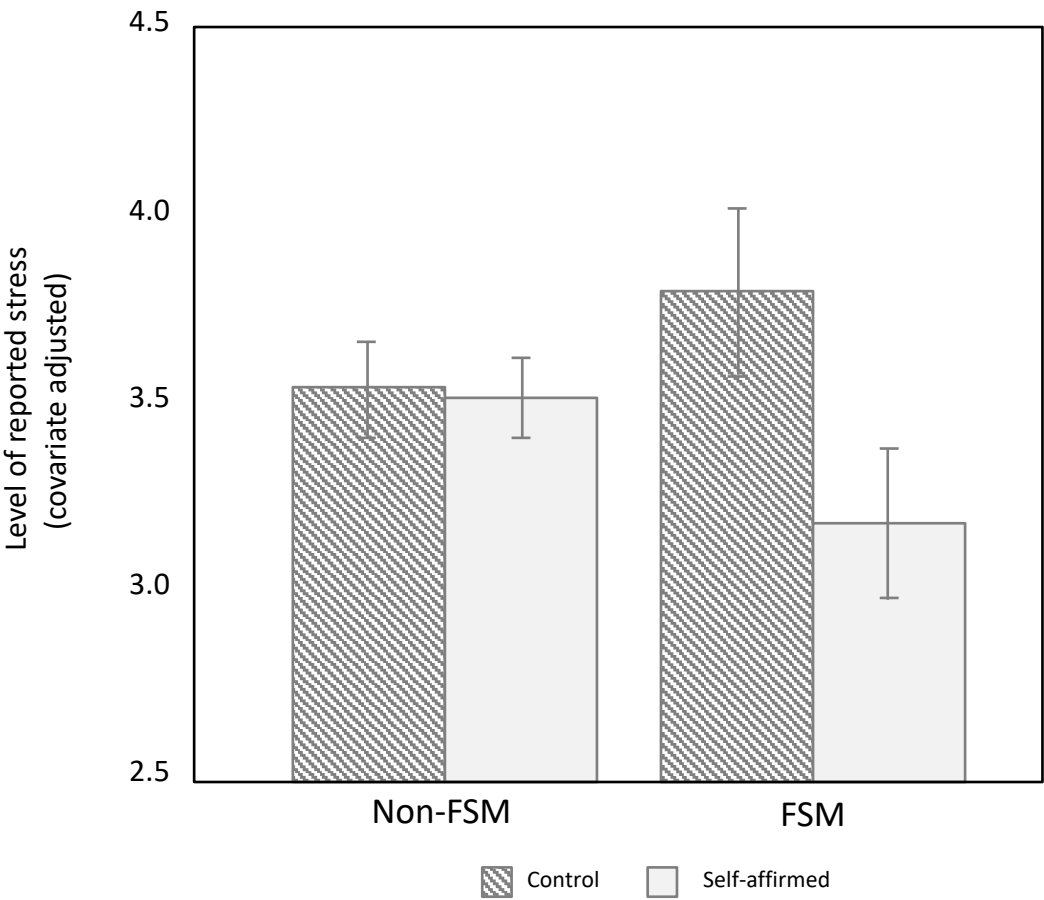


Figure 3. Reported stress as a function of free school meal (FSM) status and affirmation condition. Stress levels reported on a rating scale of 1-6.